

WHAT IS CLAIMED IS:

1 1. A method of routing alarm signals in a signaling server
2 disposed in a telecommunications network, said signaling server
3 including a plurality of cards organized into multiple stages having a tree
4 configuration, comprising the steps of:
5 generating alarm data by cards disposed at a select stage in
6 said tree configuration;
7 transmitting said alarm data by said cards to cards disposed
8 at a subsequent stage in said tree configuration;
9 multiplexing, by said cards disposed at said subsequent
10 stage, said alarm data into a serial bitstream having multiple frames by
11 allotting predetermined time slots; and
12 forwarding said serial bitstream, by each of said cards
13 disposed at said subsequent stage, through said tree configuration for
14 successively multiplexing said serial bitstreams into a single multiplexed
15 bitstream at a trunk of said tree configuration.

3. The method of routing alarm signals in a signaling server disposed in a telecommunications network as set forth in claim 2, further comprising the step of providing said single multiplexed bitstream to a controller controlling said tree configuration.

1 4. The method of routing alarm signals in a signaling server
2 disposed in a telecommunications network as set forth in claim 3,
3 wherein said controller comprises a system timing generator, and further
4 wherein said tree configuration comprises at least one clock distribution
5 module card coupled to a plurality of bus control module cards, each bus
6 control module card interfacing with at least one line interface card.

1 5. The method of routing alarm signals in a signaling server
2 disposed in a telecommunications network as set forth in claim 4,
3 wherein each of said clock distribution module cards and bus control
4 module cards is provided with an ID code in a serial framed control
5 signal generated by said system timing generator, said ID codes
6 facilitating said step of multiplexing by said clock distribution modules.

1 6. An apparatus for collecting alarm signals in a signaling
2 server disposed in a telecommunications network, comprising:

3 a system timing generator including circuitry for producing
4 a serial control signal;

5 a plurality of clock distribution modules organized into at
6 least one level in a nested hierarchy coupled to said system timing
7 generator;

8 a plurality of bus control modules coupled to said at least
9 one level of clock distribution modules in said nested hierarchy, each bus
10 control module interfacing with a plurality of printed board assembly
11 (PBA) cards disposed on a bus segment, wherein each bus control
12 module generates a status signal encoded with alarm data towards said
13 at least one level of clock distribution modules; and

14 multiplexing circuitry in each clock distribution module to
15 multiplex status signals received from one of a lower level in said nested
16 hierarchy and said plurality of bus control modules into a serial bitstream
17 having multiple frames by assigning predetermined time slots to said
18 alarm data based on control information provided in said serial control
19 signal.

1 7. The apparatus for collecting alarm signals in a signaling
2 server disposed in a telecommunications network as set forth in claim 6,
3 further comprising means in each clock distribution module for inserting
4 its own alarm data into said serial bitstream based on said control
5 information provided in said serial control signal.

1 8. The apparatus for collecting alarm signals in a signaling
2 server disposed in a telecommunications network as set forth in claim 7,
3 wherein said system timing generator comprises clock circuitry to
4 produce a system time clock based on a reference input of a
5 predetermined frequency.

1 9. The apparatus for collecting alarm signals in a signaling
2 server disposed in a telecommunications network as set forth in claim 8,
3 wherein said bus segment comprises a Compact Peripheral Component
4 Interconnect (CPCI) bus segment.

1 11. The apparatus for collecting alarm signals in a signaling
2 server disposed in a telecommunications network as set forth in claim 8,
3 wherein said serial control signal comprises a framed bitstream.

1 12. An alarm collection method using a multi-stage clock
2 distribution system in a signaling server organized in a plurality of racks,
3 each rack including a plurality of shelves, said clock distribution system
4 having a system timing generator, at least one clock distribution module,
5 and a plurality of bus control modules, each bus control module
6 interfacing with at least a portion of line cards disposed in a shelf, said
7 method comprising the steps of:

8 determining the size of said signaling server by ascertaining
9 the number of racks and assigning levels to said clock distribution
10 modules in a nested hierarchy based on said determination;

11 assigning unique IDs to said shelves;

12 generating, by said system timing generator, a framed serial
13 control signal containing unique shelf ID information and clock
14 distribution module level information;

15 generating, by each bus control module, a status signal
16 encoded with alarm data; and

17 successively multiplexing said status signal towards said
18 system timing generator through said nested hierarchy of clock
19 distribution modules into a serial bitstream having multiple frames by
20 assigning predetermined time slots to said alarm data by each clock

- 22 framed serial control signal.

1 13. The alarm collection method using a multi-stage clock
2 distribution system in a signaling server as set forth in claim 12, wherein
3 said step of assigning levels to said clock distribution modules comprises
4 the steps of:

5 if said signaling server includes more than 8 racks, writing
6 a first level code into a select field of said framed serial control signal by
7 said system timing generator;

8 transmitting said framed serial control signal to a
9 clock distribution module coupled to said system timing generator;

10 upon reading said first level code, assuming a Central
11 Level by said clock distribution module coupled to said system timing
12 generator and thereby becoming a C-Level clock distribution module;

13 changing said first level code into a second level code
14 by said C-Level clock distribution module in said select field of said
15 framed serial control signal;

16 transmitting said framed serial control signal to a
17 clock distribution module coupled to said C-Level clock distribution
18 module;

19 upon reading said second level code, assuming a Lead
20 Level by said clock distribution module coupled to said C-Level clock

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21 distribution module and thereby becoming an L-Level clock distribution
22 module;

23 changing said second level code into a third level
24 code by said L-Level clock distribution module in said select field of said
25 framed serial control signal;

26 transmitting said framed serial control signal to a
27 clock distribution module coupled to said L-Level clock distribution
28 module;

29 upon reading said third level code, assuming a Rack
30 Level by said clock distribution module coupled to said L-Level clock
31 distribution module and thereby becoming an R-Level clock distribution
32 module;

33 if said signaling server includes between 2 and 8 racks,
34 inclusive, writing said second level code into said select field of said
35 framed serial control signal by said system timing generator;

36 transmitting said framed serial control signal to said
37 clock distribution module coupled to said system timing generator;

38 upon reading said second level code, assuming said
39 Lead Level by said clock distribution module coupled to said system
40 timing generator and thereby becoming said L-Level clock distribution
41 module;

42 changing said second level code into said third level
43 code by said L-Level clock distribution module in said select field of said
44 framed serial control signal;

45 transmitting said framed serial control signal to a
46 clock distribution module coupled to said L-Level clock distribution
47 module;

48 upon reading said third level code, assuming a Rack
49 Level by said clock distribution module coupled to said L-Level clock
50 distribution module and thereby becoming an R-Level clock distribution
51 module;

52 if said signaling server includes a single rack, writing third
53 level code into said select field of said framed serial control signal by
54 said system timing generator;

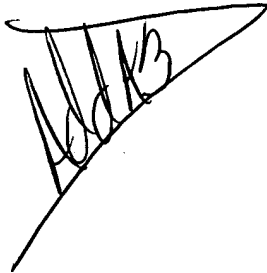
55 transmitting said framed serial control signal to said
56 clock distribution module coupled to said system timing generator; and

57 upon reading said third level code, assuming Rack
58 Level by said clock distribution module coupled to said system timing
59 generator and thereby becoming said R-Level clock distribution module.

1 14. The alarm collection method using a multi-stage clock
2 distribution system in a signaling server as set forth in claim 13, wherein
3 said step of assigning unique IDs to said shelves comprises the steps of:
4 assigning, by said system timing generator, a redundancy
5 Plane code to said C-Level clock distribution modules in said nested
6 hierarchy;
7 assigning, by said C-Level clock distribution modules, a
8 Group code to said L-Level clock distribution modules in said nested
9 hierarchy;
10 assigning, by said L-Level clock distribution modules, a
11 Rack code to said R-Level clock distribution modules in said nested
12 hierarchy; and
13 assigning, by said R-Level clock distribution modules, a
14 Shelf code to said shelves.

1 15. The alarm collection method using a multi-stage clock
2 distribution system in a signaling server as set forth in claim 14, wherein
3 said redundancy Plane code comprises a two-bit field in said framed
4 serial control signal.

1 16. The alarm collection method using a multi-stage clock
2 distribution system in a signaling server as set forth in claim 15, wherein
3 each of said Group, Rack, and Shelf codes comprises a separate four-bit
4 field in said framed serial control signal.

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